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Reef Fish Studies in the South Pacific
by Eugenie Clark

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REEF FISH STUDIES IN THE SOUTH PACIFIC

by

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The American Museum of Natural History

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Introduction and Acknowledgments

This report covers the field activities of the writer from June 24 to October 4, 1949. In addition to this time approximately three weeks were spent in traveling to and from the areas of study making a total of four months during which the writer was engaged as a zoologist by the Pacific Science Board of the National Research Council, part of an Office of Naval Research supported program entitled, "Scientific Investigations in Micronesia."

The work to be described is concerned principally with the collecting of reef fishes, particularly those of the Order Plectognathi. Collections were taken in the Marshalls, Marianas and Western Caroline Islands. A special effort was made to obtain local information and specimens of poisonous fishes. Forty-eight samples from fishes reported to be poisonous have been sent to Dr. Hermann Sommer at the Hooper Foundation in San Francisco for poison assays, also dried leaves and bark of the plant, Messerschmidia argentea Linne, reported to have the property of counteracting fish poisons, are also being tested at the same laboratory.

Due to transportation difficulties the main shipment of fish collections have not yet arrived from Koror. This report, therefore, includes only species identifications made in the field. Most of the plectognaths have been identified. A supplementary report can be submitted later when the collections arrive and are completely identified.

Transportation, living accommodations, and facilities for this trip were made possible through the generous cooperation of the Navy, the

Army, the Military Air Transportation Service, the Pacific War Memorial, a number of U. S. civil service employees, and natives of the islands visited. The writer wishes in particular to acknowledge the good logistic support of Lt. Commander P. Drucker and Miss Ernestine Akers, the kind hospitality of Commander and Mrs. Sheffield on Saipan, Mr. and Mrs. Robt. Owen on Guam, Major Richardson, Mr. Nicholson, and Colonel Skeaman of SCAP on Angaur, and the officers aboard the L.S.M. 448 and the A.G. under the commands of Lt. Shannon and Lt. Parnell who so kindly gave up part of their quarters and put up with the other inconveniences of having a single female fish collector aboard a naval vessel. Mr. Harry Uyehara, Lt. Harry Stille, Rev. W. Walter, Mr. Yoshio Kondo, and Dr. Robert Enders were helpful in many ways.

Places and dates of collections

Table 1 gives a list of the islands visited and the dates when fish collections were made.

Table 1. Names of islands and dates of collections.

Kwajalein	June 24
Guam	June 28, 29, July 2, 3, 5, 7, 17
Saipan	June 9, 10, 11, 12, 13, 14
Koror	July 21, 23, 25, 26, 27, 29, 30, 31, August 11, 14, 18, 31
Angaur	August 3, 4, 5, 6, 7, September 14, 16, 18
Babelthuap	August 20, 21
Sonsorol	August 26, 29
Tobi	August 27
Kayangel	September 4, 5, 6, 7
Nemolis	September 15
Ngulu	September 21
Fais	September 22
Ulithi	September 23, 26

Methods used in collecting.

The following methods, used in making fish collections, are discussed in the order of the frequency with which they have been employed.

(1) Poisoning. One gallon of emulsifiable 5% rotenone was supplied by S. B. Penick Co. This new preparation was used for the first time in marine fish poisoning and found to be highly effective; one ounce has been sufficient in a tide pool of approximately 240 cu. ft. of sea water. It has several advantages over the commonly used derris root powder being much less bulky, easier to use, and quicker in dissolving and spreading. Freshly mashed derris roots have also been used. This plant is easy to obtain in the Palaus. Poisoning was the most successful method for obtaining high numbers of specimens and a large variety of species. On Kwajalein, Guam, and Saipan most of the collections were made in this manner. In the Western Caroline islands, comparatively few areas for good tide pool collecting were found. In the Koror vicinity of the Palaus much of the coastline drops off suddenly into deep water and in many places it is acutally undercut at the water level. Many of the other islands have tide pools but with little or no vegetation nor live coral and the number of species inhabiting these pools is limited. The time for poisoning is fairly well restricted to a short period around low tide (during the time spent in the Western Carolines there were few appreciable minus tides), and conditions were not always favorable for low tide collecting. Some smaller plectognaths were obtained in this manner, particularly the smooth blowfishes, canthigasters, monacanthids and balistids. The next method to be described was often more practical.

(2) Spear fishing. This was the most direct method for securing specific and rarer types of fishes, particularly the plectognaths. It also afforded the opportunity to observe the habitats and habits of some reef fishes. The writer, equipped with a face mask, accompanied one or several of the highly skilled native divers and pointed out to them the specimens desired making a total of approximately 56 hours of underwater observations. In the clear reef waters many of the species could be identified from distances of 20 feet or more. Fortunately the plectognaths are not fast swimmers and seem to depend more on their protective armature to escape enemies; hence they are easy targets for a long handled spear or spear gun.

Spears with several prongs proved useful in catching smaller specimens in open reef waters. In this manner choice examples of various species of canthigasters, the brilliantly colored little file fish, Oxymonacanthus longirostrus, and the rare Paraluteres prionurus were secured. For larger fishes, however, the single pronged spear is more effective.

Larger species of file fish, Cantherines sandwichiensis, C. pardalis, and Amanses scopas, are speared with little difficulty while they are swimming. When chased for a short distance they frequently retreat under a coral ledge or hollow, remain almost motionless except for the movements of their transparent fins, becoming the easiest targets. Blowfishes and trunkfishes likewise are easy to hit because they hover about one spot. The tough carapace in which trunkfishes are enclosed, however, is not easy to penetrate and the spear must be plunged with strength.

Trigger fishes when alarmed have the habit of "locking" themselves in holes and crevices where they quite often can be speared and, if necessary, chopped out by breaking away the coral. Melichthys radula and numerous species of the general Balistes and Balistapus were obtained in this manner. A few of the larger species of trigger fish, Balistes flavimarginatus, B. viridescens, and the spectacularly marked B. conspicuum were more difficult to catch. Like the other triggerfish they may lock themselves in holes and crevices but more often they do not retreat undercover. These fish were seen quite often in water 18 feet and deeper--a number of yards away from the edge of fringing reefs. Spearing them in the open was extremely difficult as they swam away quickly and directly without seeking shelter. Most of our specimens were caught by heading them off into shallower water until they were forced into a crevice. Large specimens of B. flavimarginatus, although seen a number of times, always escaped to deep water.

Although spear fishing is easier at low, slack tide, it need not be restricted to any particular time unless there is not enough light to see. It is surprising how little light is required. In Kayangel a fine collection of plectognaths was made on a rainy dense cloudy day. Despite the rough surf and ocean surface, the under waters off shore were calm and light enough for spear fishing.

(3) Trap Fishing. By making rounds of some of the native fish traps on Guam and Koror, a number of plectognaths were secured as gifts or by buying them from the trap owners and many types of larger reef fishes

have been examined. Two types of traps were seen frequently. On Guam off Asan Point and in Ylig Bay traps made from bamboo and chicken fence wire are permanently set in water up to about 6 feet. Three long fences radiate from a main enclosure which leads into a cage in which most of the fish are trapped (see figure 2). Balistids, tetraodontids, and Diodon hystrix were the common plectognaths caught, as well as numerous species of parrot fish, squirrel fish, bass, snappers, surgeon fish, butterfly fish, an occasional moray, small shark, crabs, lobsters, squids, etc. In the Palau's, quonset shaped bamboo traps $2\frac{1}{2}$ to 4 feet high and with a base about 3 by 4 feet were set by the natives in water up to 10 feet. They were held in place with large stones and every few days pulled up by hand and emptied. (See figures 4 and 6)

(4) Hand net fishing. A variety of nets are worked by hand. One method used by some Palauan fishermen procures a small variety of fishes, mostly acanthurids and pomacentrids. Two elongated, shallow water, wire nets are set around a stone which is then lifted and the agitated fish hiding underneath are frequently caught in the quickly pulled up nets. Large, circular throw nets are used in shallow water especially on fringing reefs but again few varieties of fish are caught by this method. Acanthurids, particularly Hepatus triostegus, are the most common victims.

(5) Hook and line fishing. Several specimens of the rare Canthidermis viola were obtained from fishermen in Angaur who used hand lines outside the reefs at depths over 6 fathoms. A number of pelagic fishes were examined from trawling catches--mostly barracudas and scombiid fishes.

(6) Use of explosives. One collection of fishes was made by blasting underwater with dynamite under the supervision of Major Richardson on Angaur. Thirty sticks of dynamite were set off just under the surface of

water about 30 feet deep on the north side of the island near the garbage dump. About 150 fair to large size food fish were obtained representing, however, only 21 species. The only plectognaths collected were Balistapus rectangulus, Balistes chrysopterus, and Balistes vidua. Most of the smaller reef fishes in the area of blasting did not appear affected.

(7) Other methods. Occasionally series of young trigger fish of the genera Balistapus and Balistes were captured by merely picking up chunks of coral from shallow water near eel grass and sandy bottom. By shaking the coral over a net or breaking it open on shore, the young trigger fish fall out of the crevices. A few large fish were obtained by throwing a spear from above the water, down into the swimming fish. (See figure 10).

Plectognath Fishes

Over 422 specimens representing at least 33 species of plectognaths have been collected and preserved in formalin for the collections of the U. S. National Museum, The American Museum of Natural History, and the Bernice P. Bishop Museum in Honolulu. Most of the species have been identified. The pelagic molid, deep sea triacanthid, and the rare triodontid families of the Order Plectognathi are not represented in the writer's collection probably because of the rarity and/or the limitation of the collecting methods to areas around shallow reef waters. The balistids and tetraodontids are among the most common reef fishes. Table 2 gives the number of specimens of each species collected at each of the islands visited. In 1939¹, T. Abe published a list of all the fishes ever reported from the Palau Islands. The following plectognaths, collected by the writer, are new records for the Palaus: Balistes vidua, Melichthys radula, Canthidermis viola, Amanses scopas, Cantherines sandwichiensis, and a species of Canthigaster and one of Tetraodon which have not yet been identified.

Balistidae

This family is reported in the literature to contain poisonous species. In the Palaus, however, none of the local species are considered poisonous by the natives. The flesh is eaten raw and cooked, and the viscera regarded as harmless. Balistapus aculeatus, B. rectangulus, B.

¹ A list of the fishes of the Palao Islands. Contribution from the Palao Tropical Biological Station, No. 22. Studies No. 4. 523-583.

Table 2. List of plectognath fishes collected.

	Kwajalein	Saipan	Guam	Fais	Ulithi	Ngulu	Kayangel	Babelthaup	Koror	Nemolis	Angaur	Sonsorol	Total
Balistidae¹:													
<i>Balistapus aculeatus</i> ¹	8	10		4		3	1	21					
<i>Balistapus rectangulus</i> ¹	1		3			1	4			8		2	
<i>Balistapus undulatus</i>		1		1	1	1		7	2	3	1		
<i>Balistapus verrucosus</i>								10					
<i>Balistes bursa</i>			2									1	
<i>Balistes chrysopterus</i>				6		3	4	5	1	7			
<i>Balistes conspiculum</i> ¹					1							1	
<i>Balistes vidua</i>	2		1	3	3	2	2		9	6	3		
<i>Balistes viridescens</i>				1		1							
<i>Melichthys radula</i>					1	3			2	2			
<i>Canthidermis viola</i>										3			
Monacanthidae¹:													
<i>Cantherines sandwichiensis</i> (?)				1	3				1	2	4		
<i>Cantherines pardalis</i>		4	4	3	1			3	1	2	2		
<i>Monacanthus tomentosus</i>									1				
<i>Oxymonacanthus longirostris</i>	6			3									
<i>Amanses scopas</i>						1		2			2		
<i>Paralutereres prionurus</i>						2							

	Kwajalein	Saipan	Guam	Fais	Ulithi	Ngulu	Kayangel	Lauelthaup	Koror	Nemolis	Angaur	Sonsorol	Tobi
Ostraciidae ¹ :													
<i>Ostracion tuberculatus</i>							1	1	1	6		2	
<i>Ostracion lentiginosus</i>		1					3	1	1		2	1	
Canthigasteridae ¹ :													
<i>Canthigaster margaritatus</i> 1	50 ¹	50 ¹			5								
<i>Canthigaster solandri</i>					1								
<i>Canthigaster bennetti</i>	1												
<i>Canthigaster cinctus</i>						3			1				
<i>Canthigaster sp.</i> ²		1				2							
<i>Canthigaster sp.</i> ²						1			1				
Tetraodontidae ¹ :													
<i>Tetraodon hispidus</i> ¹		1					1	4		2	2		
<i>Tetraodon immaculatus</i> ¹	7	7						14					
<i>Tetraodon nigropunctatus</i> ¹		1		1		1	1	4					
<i>Tetraodon mappa</i>							1		3				
<i>Tetraodon (reganis ?)</i> ²								1					
<i>Tetraodon (meleagris ?)</i> ²				1	5								
<i>Tetraodon sp.</i> 2		1											
Diodontidae ¹ :													
<i>Diodon hystrix</i>					2	2		2	1	2		1	

¹Reported as poisonous in the literature.

²Species not yet identified.

verrucosus, and Balistes chryopterus were found common close to shore, the adults frequently were seen in water less than 3 feet deep. The other species of trigger fish were seen in deeper water. Balistapus undulatus, Balistes vidua, and Melichthys radula were seen in large numbers in reef waters from a few to 25 feet deep around all of the islands visited in the Western Carolines. Balistes conspiculum, B. viridescens, and B. flavimarginatus were usually seen in reef waters 20 feet or deeper - not very common, but when seen the adults were usually in pairs and swam about close together. Balistes bursa was not common. The only specimens seen were captured by our spear fishermen and these occurred in reef waters about 8 feet deep. No specimens of Canthidermis were even seen although other fishes were frequently observed and identified in water over 30 feet deep.

Monacanthidae

This is another family reported to be poisonous yet considered harmless by Palauans. The natives use the skin as sandpaper. Although they are used as food they are scantily meated and considered poor eating.

The writer is not yet certain of the identification of the species listed in this report as Cantherines sandwichiensis. Two of those caught on spears became conspicuously spotted with white all over the body but these spots did not persist after death. A number of large specimens (all over 6 inches) were seen in reef water over 10 feet deep. They always appeared to have a solid dark brown body except for a pale caudal peduncle on which there are usually about 4 spines on each side. These spines are larger on the male. The eye stands out as a bright

orange-yellow. The fins are pale, the caudal, dorsal, and anal being a pale orange-yellow, on females, and a brighter orange on males. The male caudal peduncle was frequently bright orange.

Cantherines pardalis, the most common filefish seen around reefs in the Western Carolines, looks and behaves very much like the West Indian C. pullus. When swimming undisturbed the body appears almost a solid blackish brown with a conspicuous white spot just behind the dorsal fin. When caught on a spear a remarkable color change takes place. The body becomes very pale, faintly violet, with a number of regularly spaced orange spots and with dark radiating lines from the mouth on the head region. The dorsal, anal, and pectoral fin rays are orange-yellow. The caudal rays are brown and the membrane between them a pale olive. The body of preserved specimens is uniformly dark.

Oxymonacanthus longirostrus was not very common. Several of these were seen in the reefs off Kayangel but could not be caught with our large single pronged spears. The adults seldom exceed 3 inches in length. Sexual dimorphism was noted on the fresh specimens caught on Saipan and Ulithi (Mog Mog). The ventral flap is a bright orange with a few white spots, and the belly region above the flap is dark brown with many small white spots in the male whereas these regions are a uniform pale olive in the female. The space between the posterior margin of the flap and the anus is noticeably wider in the female.

Paraluteres prionurus, a rare fish about which little is known, was seen only near Kayangel where two specimens were observed for about

20 minutes before they could be speared. They exhibited the most remarkable case of mimicry in fishes that the writer has ever come across. They so closely resembled the poisonous Canthigaster cinctus that the writer and the native divers, the latter keenly familiar with their local fish, believed these fish were C. cinctus until we speared and examined them. The general body shape and size is like that of a typical Canthigaster and the markings on the body almost identical with C. cinctus. When speared, however, it did not inflate but erected a first dorsal fin with a single spine revealing its identity as a monacanthid. Closer examination showed many rayed dorsal and anal fins, many teeth, and spines on the caudal peduncle, all characters which immediately distinguish it from the canthigasters. Our two specimens were found in 8 feet of water around a cluster of corals where there were also specimens of C. cinctus. P. prionurus behaved exactly like C. cinctus in its manner of swimming, hovering--occasionally with its tail curled slightly to one side. The following color notes were taken on fresh specimens. A mature male had a tan color to the body with 4 wide, dark brown saddle marks across the back: the first is between the eyes and extends onto the anterior portion of the first dorsal fin, the second starts behind the gill openings, and crosses the back a little behind the posterior region of the eye and anterior to the beginning of the second dorsal fin and extends onto the posterior three-quarters of the first dorsal fin, the third starts on the belly and crosses the back at the base of the first half of the second dorsal, the fourth crosses below the posterior part of the second dorsal and most of the caudal peduncle. There are 4 short radiating lines from the lower anterior margin of the

eye. Small bright blue spots are present on the lower part of the body from below the mouth to the base of the anal fin. A blue mid ventral line on the belly extends posteriorly to the anus and another blue line runs parallel and close to this one on either side of the body. Region before the eyes is covered with small brown spots. A dark brown spot surrounded by a light blue circle, about the size of the pupil, is present below the eye near the ventral margin on both sides of the body. The first dorsal fin has some thin olive and bright blue horizontal lines near its base. The rays of the second dorsal and anal fins are colorless and the membranes pale orange. Anterior part of caudal fin is brown with pale spots and posterior part is a bright greenish yellow. The iris is brown with an inner rim of yellow. The spines on the caudal peduncle are pale olive and have a brushlike patch of scales anterior to them. The other specimen, a female, was similarly colored except the membranes of the second dorsal and anal were colorless, the caudal a solid olive and the small blue spots paler than on the male. No spines or brushlike patches of scales are present on the female's body.

Ostraciidae

Though the members of this family are reported to be poisonous, the Palauans consider them harmless and the most palatable of the plectognath fishes. The two species collected were common around the reefs of all the islands visited in the Western Carolines.

Canthigasteridae

This family of small puffer fishes is hardly ever used as food because of the small amount of flesh. The Palauans believe the eggs are

poisonous. Canthigaster margaritatus, probably the most common reef fish in shallow water around the Marianas was much scarcer in the Ulithi group of islands and never seen in the other Western Caroline islands visited. Although on Abe's check list for the Palaus, the writer believes it comparatively uncommon. Field identification of two species of Canthigasters collected was found difficult--one is probably a new species.

Tetraodontidae

This is the most notorious family of poisonous food fish. The natives in the Western Carolines eat the flesh of all the local species but carefully avoid the viscera particularly the mature ovaries which are considered highly poisonous. A case of poisoning occurred on Koror during the writer's stay. One of the natives, Stanislaus, depressed by some family troubles, ate one of the mature ovaries of a large Tetraodon mappa. He suffered from severe cramps and went into a condition of shock a few hours after eating the roe and was hospitalized for five days.

Diodontidae

The diodontids are reported to be poisonous in the literature and the natives in the Western Carolines generally avoid eating the viscera of these fishes because of their close relationship to the tetraodontids. In Kayangel, however, the natives claim that the viscera is not poisonous and that the eggs are good to eat. Diodon hystrix was the only species of this family collected or seen by the writer. This species, however, was very common in shallow and deep reef waters.

Other Poisonous Fishes

Siganidae

In the Palau Islands no other group of fishes outside of the plectognaths, are considered poisonous to eat. In the village of Geklau on Babelthaup, however, the natives report that the flesh of Siganus fuscescens and S. lineatus taken from the bay just south of Geklau during the months of October through January causes effects similar to alcoholic intoxication when eaten in large quantities, and the skin has an astringent effect on the lips. All over the Palau's the siganid fishes are one of the most popular food fish and these same species are not known to have intoxicating effects in any other locality. A special trip was made to Geklau to check the identity of these fishes. Three specimens of S. lineatus and seven of S. fuscescens were speared in the Geklau bay on August 20th. The natives reported that during the season of their inebriating powers the siganids gather in large numbers in the Geklau bay and a strong east wind at this time is associated with an abundant growth of certain algae. Some of the fin spines of these fishes are associated with poison glands and should be handled carefully.

Muraenidae

A large male specimen of Gymnothorax flavimarginatus, a species of moray eel supposed to have poisoned some Filipinos eating it on Saipan, was captured in a tide pool on the northwest tip of this island. Samples of the flesh and viscera were tested on mice by Dr. Sommer and gave no poisonous effects.

Scorpaeniidae

The scorpaeniid fishes are the most dangerous of the venomous fishes. They are not poisonous to eat but have sharp fin spines, some of which are associated with poison glands. Two specimens of Pterois volitans were collected in Saipan and over a dozen specimens of various rock fishes in the Western Carolines. While on Kwajalein, the writer interviewed a Seaman G. E. Knight who had been hospitalized with a case of fish poisoning. He had attempted to catch with his hand a sluggish fish among the rocks in shallow water. A single prick between the thumb and first finger of his right hand had caused his whole arm and shoulder to be greatly swollen and numb. He identified the fish from some pictures as one of the scorpion fish with a dorsally located mouth, probably Synanceja verrucosa.

Families of Reef Fishes Collected

Over 2000 specimens of approximately 174 species of reef fishes were collected. The following families, and possibly a few more, are represented. Families of poisonous fishes are starred; approximate number of species collected are indicated in parenthesis.

Engraulidae	(1)	Mullidae	(1)
Synodontidae	(2)	*Pomacentridae	(11)
Leptocephalidae	(1)	*Labridae	(5)
Ophichthyidae	(2)	Scaridae	(3)
Moringuidae	(1)	*Chaetodontidae	(12)
*Muraenidae	(13)	*Siganidae	(2)
Fistulariidae	(1)	*Acanthuridae	(5)
Syngnathidae	(1)	*Balistidae	(11)
Hemirhamphidae	(1)	*Monacanthidae	(6)
Atherinidae	(1)	*Ostraciidae	(2)
Mugilidae	(1)	*Canthigasteridae	(6)
*Sphaenidae	(1)	*Tetraodontidae	(7)
Holocentridae	(3)	*Diodontidae	(1)
*Carangidae	(3)	*Scorpaenidae	(5)
Kuhliidae	(2)	Gobiidae	(16)
Apogonidae	(5)	Blenniidae	(23)
Echeneidae	(1)	Fierasferidae	(1)
*Serranidae	(9)	Pleuronectidae	(3)
*Lutianidae	(4)	Antennaridae	(1)

Palauan names of fishes*

Fishes	NI' KEL
CARTILAGINOUS FISHES: general term for sharks	E DENG
skates and rays	RUL
eagle ray	OÁ IO
2 species of rays	RU E TU
hammerhead shark	KUL TAL BE AB ULAKL EDENG
BONY FISHES	
Elopidae: <u>Megalops cyprinoides</u>	A' OL
Clupeidae: <u>Clupea moluccensis</u> (herring)	ME KE BUD'
Symbranchidae: <u>Symbranchus bengalensis</u>	KLA' EP
Anguillidae: <u>Anguilla</u>	KI TEL EL'
Muraenidae: morays	KE SE BE KU
Synodontidae: lizard fish	E DE SE MUL'
Beloniidae: needle fish	SA KOS'
Hemirhamphidae: Half beaks <u>Hemirhamphus</u> <u>Zenarchopterus buffoni</u>	BO' LOBL KI E U
Exocoetidae: flying fish	GOK
Fistularidae: cornet fish	U' LAE'
Aulostomidae: trumpet fish	KO BE SOS'
Syngnathidae: pipefish and sea horses	EM' DĚB
Atherinidae:	TĚ BER'
Mugilidae: 2 species of mullet	E SAU KĚ LAT'

*If the Palauan term applies to only one species the scientific name is given when known. This list, far from complete, is an expansion and modification of an earlier one by Abe (1939).

Sphyraenidae: barracudas	AI
Holocentridae: one species (many others)	KE DA OL
Echeneidae: suckers	RE KE RE KED
Serranidae: <u>Therapon jarvua</u> 2 species of <u>Epinephelus</u>	KLI KLE OL TEM E KA I MI ROR
Kuhliidae: one species	BA SE MUR
Apogonidae: general term one species	SE BUS PSO DO
Carangidae: <u>Caranx</u> <u>Trachinotus</u>	U I KI KE DO BEL
Coryphaenidae: <u>Coryphaena</u>	IAS
Mullidae: goat fish, general term <u>Mulloidichthys awaflamma</u> <u>Mulloidichthys samoensis</u> 6 other species	BANG DE E TU RANG EL BANG E MIS E UL O IL BANG EL DEP SUNG EL MES E BANG EL DEP E DOP E ULE ANGEL
Chaetodontidae: <u>Platax</u> <u>Chaetodon setifer</u> <u>Zanclus</u>	ER ALE BE SOI KA RA MA RA MA DU
Toxotidae: <u>Toxotes</u>	AU LO I
Kyphosidae: rudder fish	KO MUD
Sparidae: 5 species of porgies (Lethrinidae)	ELU I KEL I TOT E ME UR ME LANG MUD UD E
Lutianidae: 2 species of snappers	KE REM LAL RE AL
Pomacentridae: <u>Pomacentrus perspicillatus</u> <u>P. lividus</u> <u>Dascyllus aruanus</u>	ETI TEL MUD E RE ME LA ME RANGD

Labridae:	<u>Choerodon anchorago</u>	BUD E
	<u>Cheilinus undulatus</u>	MAM EL
Scaridae:	<u>Callyodon muricatus</u>	KÉ ME DUKL
Acanthuridae:	<u>Hepatus triostegus</u>	E LAS
	<u>Acanthurus unicornus</u>	E RANGL
Siganidae:	<u>Siganus fuscescens</u>	ME YAS
	<u>S. lineatus</u>	KLÉ SE BUL
Scombridae:	<u>Katsuwonus pelamys</u>	MA DE SAR
Gobiidae:	<u>Eleotris pisonis fusca</u>	KLA KE SOL
	<u>Ophiocara macrolepidotus</u>	MO DE EL
Blenniidae:	3 species of blenniids	SUMÁI LA KED TUMAI TO LOK TÉ BER
Fierasferidae:	species living in sea cucumber	DÉ RI REK
Scorpaenidae:	<u>Pterois volitans</u>	E SI ED
	4 other species	SMU E O SES LO E KO KEL BE TA OT
Balistidae:	general term for smaller varieties	TUN E
	General term for larger varieties	DU KEL
	<u>Balistes viridescens</u>	DU KEL BE AB
	<u>Balistes flavimarginatus</u> (?)	DU KEL E WILT
	another species	DU KEL E RA KL
	<u>Balistes conspiculum</u>	TUN IPTAL
	<u>Melichthys radula</u>	OLI KEL TUN E
	<u>Canthidermis viola</u>	KEL BOB or NE LENG ELT
Monacanthidae:	general term	LUNG
	<u>Cantherines pardalis</u> , <u>Amenses</u>	IA LAK
	<u>scopas</u>	LUNG LIP TAL
	<u>Oxymonacanthus longirostrus</u>	
Ostraciidae:	<u>Ostracion tuberculatus</u>	RI A MEL
	<u>O. lentiginosus</u>	BU BEU
	young of <u>O. tuberculatus</u>	KE TUT EL BAD
	cowfish	KA RA MA SUS
Tetraodontidae and Canthigasteridae:	general term	TE LE BU DEL
Diodontidae:	<u>Diodon hystrix</u>	DÉ RU DEM

Notes on the pronunciation of Palauan names of fishes.

- (1). The vowels are open as in Spanish or Japanese. In the Webster's New International Dictionary they are close to the following symbols:

a = ā, e = ē, i = ī, o = ī, u = ū.

- (2). The "D" is pronounced with the tongue pressed against the upper front teeth, a sound intermediate between the English "D" and the voiced "TH".
- (3). The "B" is a half voiced sound intermediate between the English "B" and "P."
- (4). The "R" is rolled as in Spanish or Japanese.
- (5). The accent mark is placed at the end of the accented syllable (').
- (6). ~ over a vowel designates a short vowel that is barely pronounced, sometimes completely slurred over.
- (7). ē at the end of a word designates a sound similar to an extremely light cough.

Ulithi and Fais names for a few poisonous fishes

Scorpaenidae: poisonous rock fish	LE' U
Balistidae: small trigger fish	BUB
<u>Balistes flavimarginatus</u>	NUF
<u>Balistes viridescens</u>	LU LU'I
Monacanthidae: file fishes	PA RA TET
Ostraciidae: trunk fishes	TA VE TEF
Puffer or blow fishes	LUCH

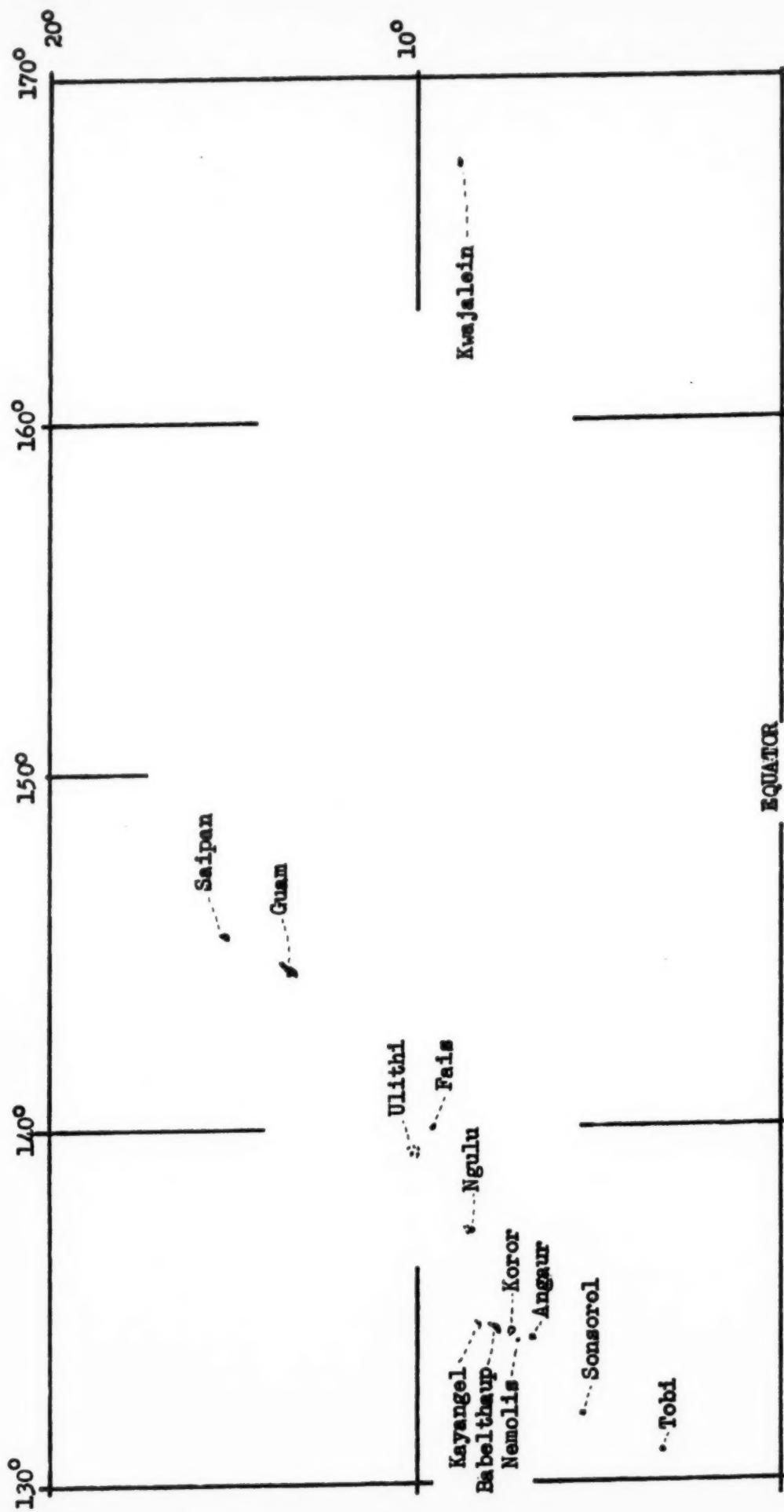


Figure 1. LOCATION OF ISLANDS MENTIONED IN THIS REPORT

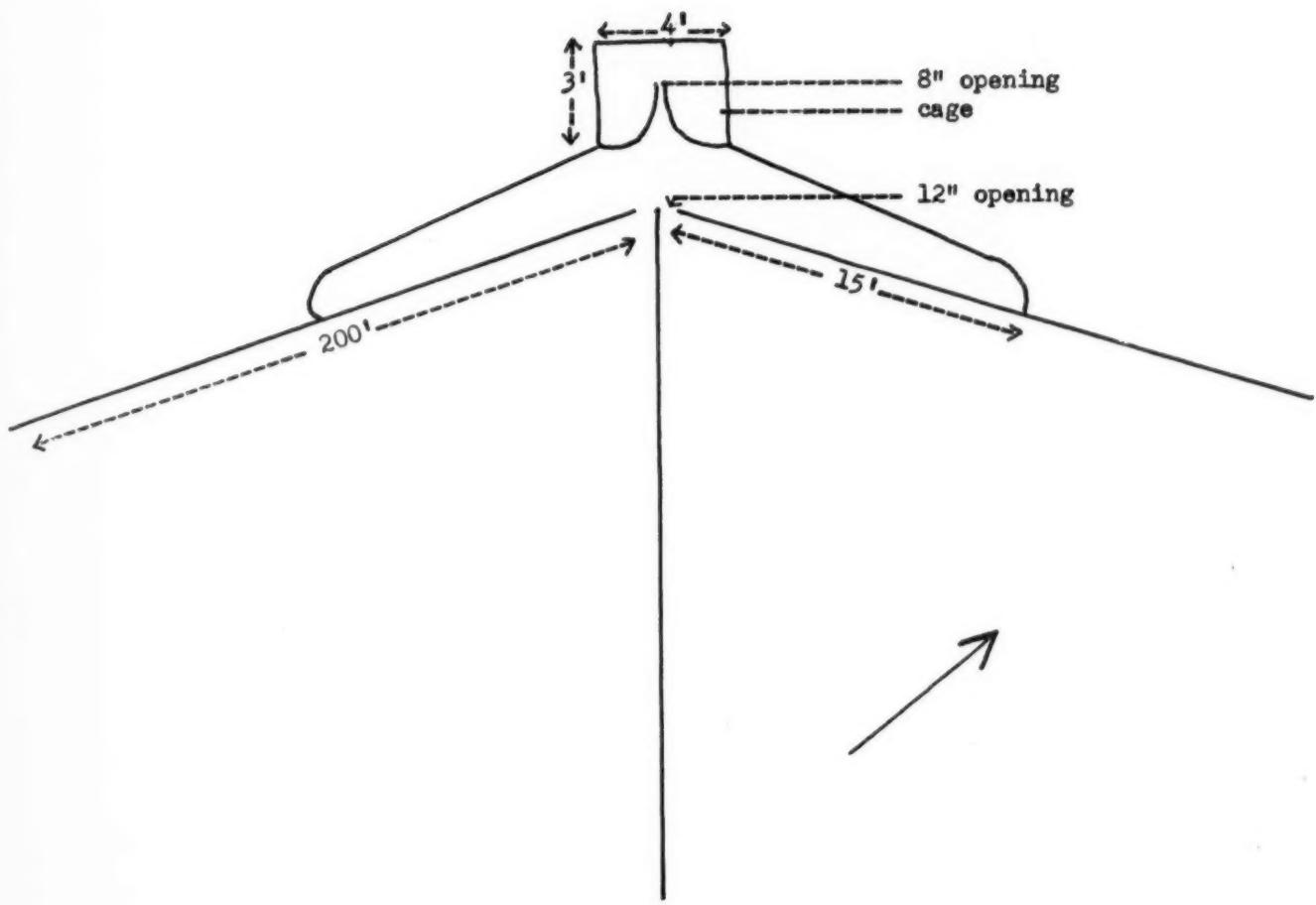


Figure 2. Diagram of fish traps on Guam (off Asan Point and in Ylig Bay) built by natives from bamboo and chicken wire fence. Approximate measurements are given in inches and feet. The large arrow indicates the direction of the outgoing tide.



Figure 3. An outrigger canoe and two native fishermen from Koror.



Figure 4. Side view of a bamboo fish trap and the same natives and canoe shown in figure 3.

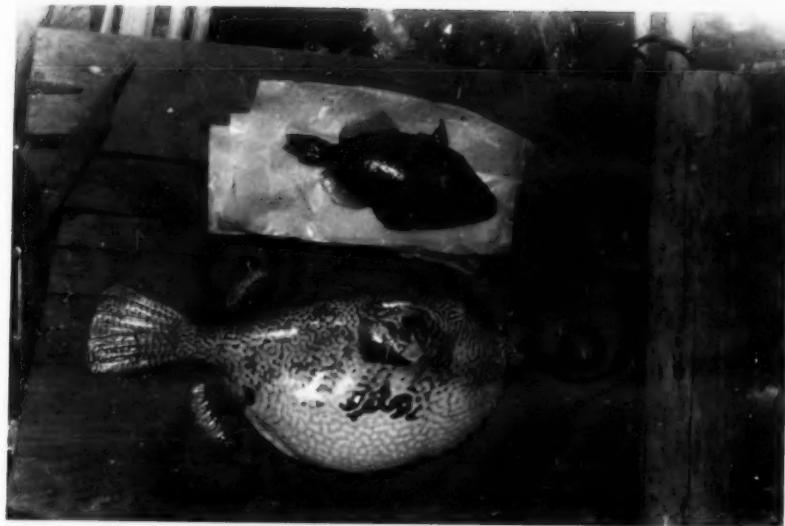


Figure 5. Balistapus undulatus (upper) and Tetraodon mappa caught in the fish trap shown in figure 4. The ovaries of T. mappa are highly poisonous but the flesh is used for food.



Figure 6. Front view of a bamboo fish trap used on Kayangel.



Figure 7. Bamboo raft used for poling over shallow water while spearfishing. Photo taken in bay south of Geklau on Babelthaup where the toxic siganid fishes occur.



Figure 8. A throw net hung up to dry. Photo taken in village of Geklau, Babelthaup.



Figure 9. A Palauan spearfisherman, standing on the bow of a small boat, pointing in the direction of a large fish.



Figure 10. With a spear in each hand, in case the first one misses, a Palauan fisherman prepares to spear a fish.

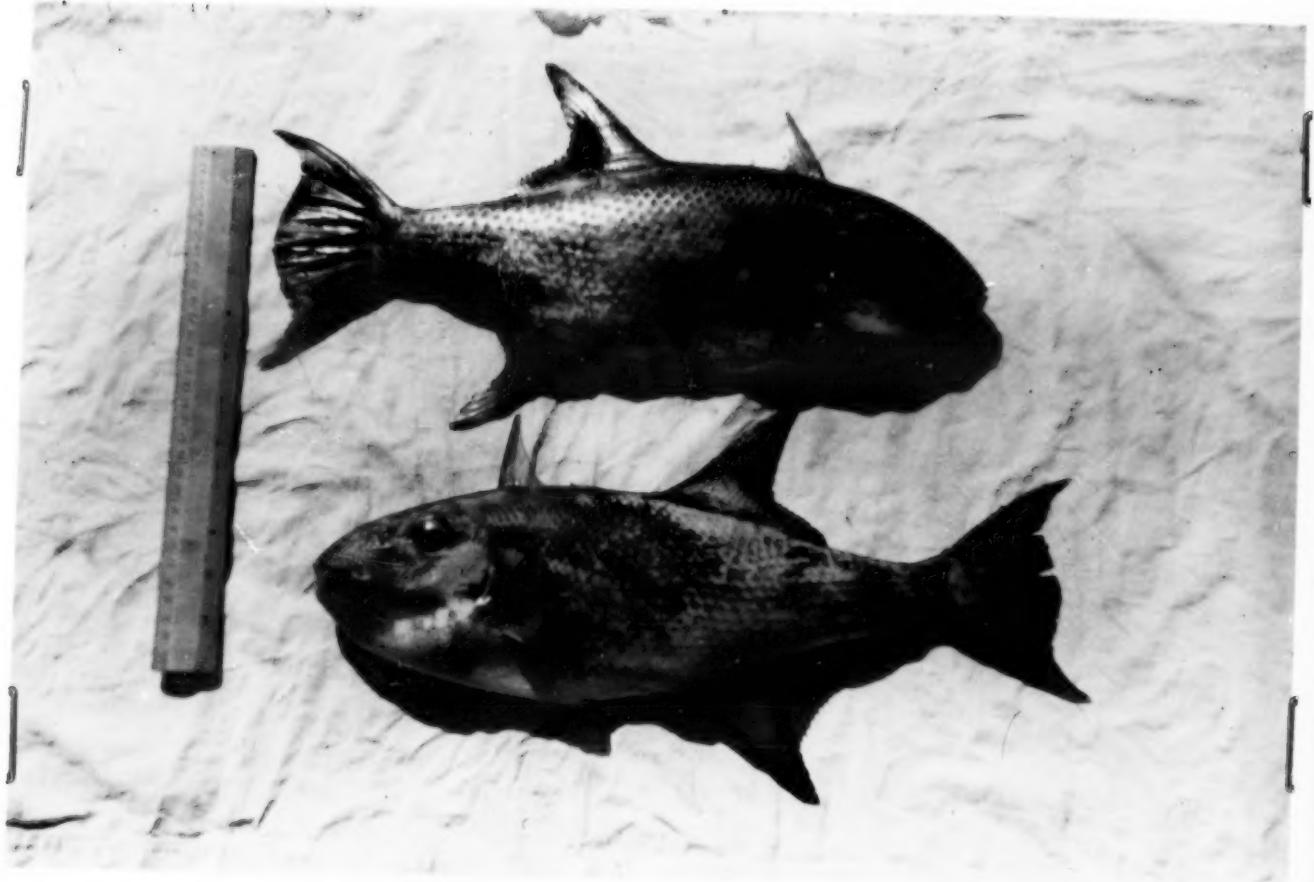


Figure 11. Male (upper) and female specimens of Canthidermis viola Herre, a rare trigger fish reported from the Palaus for the first time. These were caught on hook and line in 8 fathoms off the island of Angaur. The natives use the flesh for food. The toxicity of the viscera is being investigated.



Figure 12. A native spearfisherman of Sonsorol holding a specimen of the poisonous trigger fish, Balistes conspiculum.



Figure 13. The writer equipped with face mask and spear used for reef fishing.



Figure 14. The writer with two native fishermen from Fassari, Ulithi with a rubber boat used to hold specimens while spear-fishing.